EXHIBIT B

WORLD ECONOMIC AND FINANCIAL SURVEYS

International Capital Markets

Developments, Prospects, and Key Policy Issues

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with
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INTERNATIONAL MONETARY FUND
Washington, DC
September 1996

ISBN 1-55775-609-0
ISSN 0258-7440

Price: US$20.00
(US$12.00 to full-time faculty members and
students at universities and colleges)

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deemed less informative and less transparent due a slow or an underutilized electronic broking system, users may exit the market completely. In this situation, turnover and liquidity will fall and volatility is likely to rise.

At this time, electronic broking systems are still in the nascent stages of development and they suffer from a "chicken and egg" problem that routinely occurs in new markets. If liquidity is low, few participants want to trade. However, unless participants are willing to use the system, liquidity will remain low. Nevertheless, the most recent trends show that turnover on electronic broking systems is growing quickly. If, as expected, liquidity on these systems improves and users become more comfortable with the systems' operations, users will be less likely to retract from the electronic broking systems even during a period of stress. In addition, technological advancements, such as the ability to enter contingent orders and an increase in processing speeds, are likely to be instituted, making order execution glitches more remote.

Management of Systemic Risk

Settlement Risks

The BIS survey estimates a global average foreign exchange volume of $1.2 trillion a day, implying that two-way contract payments of $2.4 trillion flowed through national payment and settlement systems in various countries in April 1995 (Box 10). In New York, 70 percent of this volume was executed by the top 20 banks. Many small transactions, as well as some very large ones, must be reconciled between counterparties and the funds exchanged. There are an estimated 125,000 to 150,000 transactions every day, necessitating 250,000 to 300,000 exchanges of currency. The Clearing House Interbank Payments System (CHIPS), through which most dollar foreign exchange transactions are settled, estimates that it alone facilitates $600 billion in foreign exchange transactions each day.

Large settlement sizes pose at least two problems. The first has been called Herstatt risk, named for the failure of Bankhaus Herstatt in 1974. Banks are exposed to large amounts of cross-border settlement risk because irrevocable settlement of the separate legs of a foreign exchange transaction may be made at different times. For example, delivery of yen to the Japanese correspondent bank of a New York bank in Tokyo occurs during Tokyo business hours. The corresponding delivery of dollars by a New York bank to the U.S. correspondent bank of a Japanese counterparty in New York would occur during New York business hours. Since the two national payment systems are never open at the same time, this gives rise to the risk that after the first counterparty has already delivered one side of the transaction, the other counterparty may go bankrupt and fail to deliver the offsetting currency.

More than 20 years after the collapse of Herstatt, there is no widely accepted method of quantifying settlement risk. Only recently have attempts been made to quantify and measure foreign exchange settlement risk. The Foreign Exchange Committee in its report entitled "Reducing Foreign Exchange Settlement Risk" was the first to survey foreign exchange dealers and provide a methodology for examining settlement risk and a set of recommended best practices.[40] The more recent report from the Group of Ten Committee on Payment and Settlement Systems, the Allsopp Report,[41] released in March 1996, builds on the earlier methodology, analyzes existing arrangements, and sets out a strategy for reducing settlement risk. The report finds that foreign exchange settlement is not just an intraday phenomenon and that interbank exposures can last, at a minimum, one to two business days. Further, it can take an additional one to two business days before a bank knows with certainty that it has received the requisite payments. The Allsopp Report finds that, given current practices, the amount at risk at a bank could exceed three day's worth of trades, so that the exposure to even a single counterparty could exceed a bank's capital. Indeed, the global estimates of daily turnover exceed the total equity of the world's largest 300 banks. While the risk is only beginning to be recognized and quantified, recent foreign exchange payment defaults, including those of the Bank of Credit and Commerce International (BCCI) and Barings Plc,[42] demonstrate that the risk cannot be ignored.

The second problem is a liquidity issue. Failures to pay could arise from operational or systems problems, as well as a counterparty bankruptcy. In most cases, operational failures can be resolved within a 24- to 48-hour period and overnight funding can be obtained to cover the failed delivery. It is not uncommon, however, to have more than $2 billion outstanding between banks overnight. A large operational failure could surpass the ability of even some of the best-capitalized institutions to access money markets, especially when notice of the failure is received during off-hours in the institution's domestic market or when the undelivered currency is not one in which the exposed institution customarily borrows. This is an especially salient issue in emerging markets where transaction sizes are growing, but the physical infrastructure for payment and settlement systems may not yet be ade-

[40]See Foreign Exchange Committee (1994).

[41]Bank for International Settlements (1996b).

[42]The collapse of Barings Plc in February 1995 caused problems in ECU clearing that were resolved. However, the problems could easily have escalated into a situation where settlement could have been frustrated, causing the breakdown of payments among the 45 ECU clearing banks.

Box 10. Settlement Procedures

Foreign exchange transactions are not settled directly by the counterparties, but are routed through the national payment systems corresponding to the traded currencies. Typically, only banks licensed within the local jurisdiction have direct access to that country's payment facilities. Most counterparties (other than local banks with direct access) will use a correspondent bank to carry out the settlement procedure. The typical process by which a dollar-pound sterling transaction is settled is shown in the figure.

In the United States, although dollar payment instructions can be routed directly through to Fedwire—the large-value, real-time gross settlement funds transfer system—settlement services for most of the dollar legs of foreign exchange transactions are provided by the Clearing House Interbank Payments System (CHIPS).[1] CHIPS is a private, dollar-clearing system owned by the New York Clearing House Association, a group of major New York banks. CHIPS nets payment transactions multilaterally among its members and settles the net amounts at the end of the day. At the end of every business day, banks are notified regarding their net position. Banks with a net debit position within CHIPS transfer the owed funds via Fedwire to a CHIPS net settlement account at the Federal Reserve Bank of New York.[2] Once all net debit positions have been paid, CHIPS releases payments to the accounts of banks with net credit positions. In the United Kingdom, a similarly structured payment system, Clearing House Association Payments System (CHAPS), settles pound sterling transactions through banks' accounts held at the Bank of England, which is itself a member of CHAPS.[3] CHAPS settles on a multilateral net basis at the end of each day across accounts held at the Bank of England.

Consider, for example, the common method to settle a sterling-dollar transaction between a U.S. bank that sells dollars for sterling to a U.K. bank, with the sterling payment being made first. Assuming the U.K. bank is a member of CHAPS, the U.K. bank pays sterling into its account at CHAPS,[4] where the payments are netted with other payments to be received or paid by the U.K. bank. At the end of the business day, CHAPS makes the payment and credits the account of the CHAPS member bank acting on behalf of the U.S. bank.[5] The U.S. bank's account with the correspondent bank is, in turn, credited. The U.S. bank routes its dollar payment order to its U.K. counterparty through CHIPS.[6] At the end of the U.S. business day, CHIPS requests payment from the U.S. bank for the amount of dollars to be paid to the U.K. bank and receives this sum in its account at Federal Reserve Bank of New York. After CHIPS receives the payment, it

[1]CHIPS estimates that about 50 percent of the transactions are related to foreign exchange deals.

[2]Since the Federal Reserve Bank of New York is not a member of CHIPS, the two circles in the figure representing these institutions are separated.

[3]Thus, in the figure, the Bank of England and CHAPS are represented as overlapping circles.

[4]If it is not a CHAPS member, then it pays sterling to a correspondent bank that is a CHAPS member for the member to execute the transaction on its behalf.

[5]Assuming, after netting, that the U.K. correspondent bank is owed sterling.

[6]If the U.S. bank is not a member of CHIPS, then a correspondent bank that is a member makes the payment on the U.S. bank's behalf.

quate to accommodate transactions in large numbers or sizes.

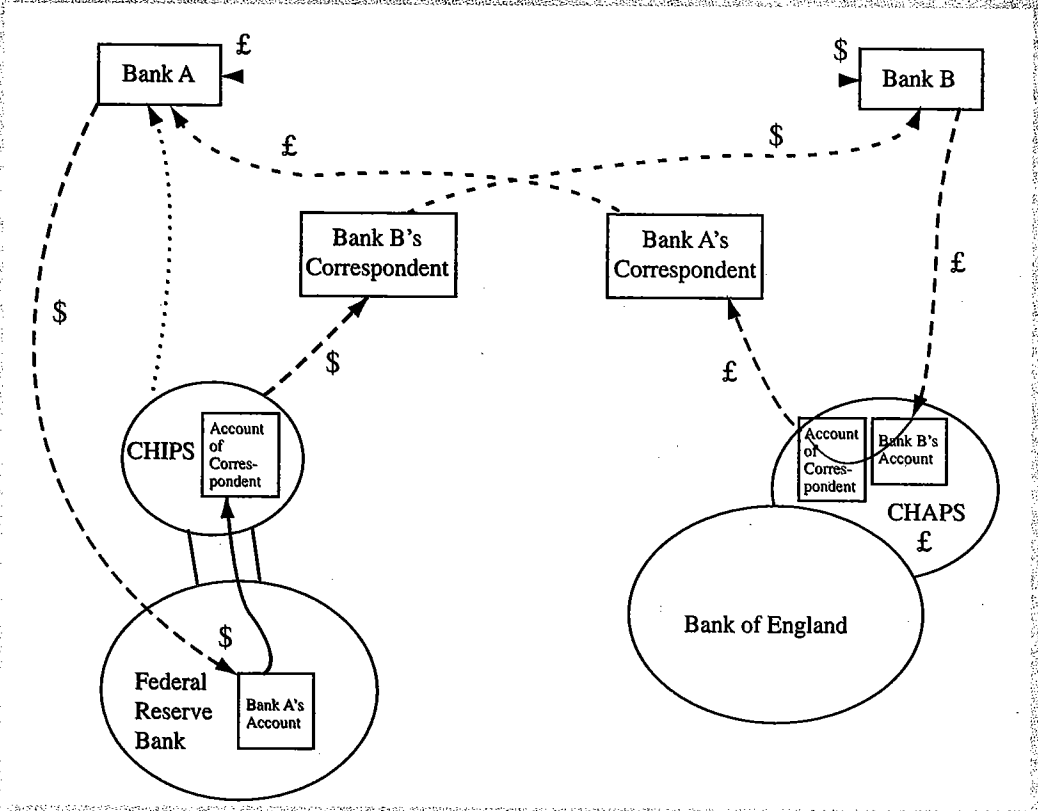
Either of these problems can lead to a situation in which a delivery failure causes a systemic problem. The most commonly articulated scenario is a "domino effect," in which the failure of one large bank causes a second bank to fail, which causes a third, and so on. Another situation might arise in which, independently, a small number of institutions fail to deliver, causing other institutions to fail or to encounter liquidity problems. Using actual gross settlement numbers from a specific day in 1994 when the yen appreciated against the dollar by 5 percent, MULTINET, a proposed multilateral netting facility, was able to show that the failure of the participant with the largest position within their system could have caused the failure of a number of other participants. This example, constructed using only a few institutions, shows how a large settlement failure can be potentially disruptive to the smooth functioning of the international financial system.

Payment and Settlement Solutions

Settlement risks, both for individual banks and for the financial system as whole, can be ameliorated in a number of ways (see Box 10 for current settlement practices). Most observers believe that settlement risk would be eliminated with the use of a multicurrency "payment versus payment" (PVP) system. Using PVP, settlement in one currency is made if and only if payment in the other currency has been received.[43] For the PVP system to eliminate Herstatt-type risk, a third party needs to assure that both sides to a transaction

[43]"Delivery versus payment," the analogue to PVP in the securities industry, requires that payment be withheld until delivery of the security is made.

Current Settlement Process



credits the U.S.-based correspondent bank, a CHIPS member, that the U.K. bank uses for its dollar-denominated transactions. A similar procedure is used for most major currencies, whereby banks typically utilize correspondent banks that have access to national payment systems.

make payments before the amounts owed to the two parties are simultaneously released.[44] The third party must also be able to guarantee the finality of payment, that is, the irrevocability of the payments and the ability of counterparties to use their payments when they are received. For this reason, it is often assumed that PVP requires the existence of a real-time gross settlement (RTGS) system which provides for immediate and final settlement of funds.[45] As of May 1996, France, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom, and the United States had operating RTGS systems. In Europe, the TARGET system will link together national RTGS systems.[46] Members of the European Union are currently developing national RTGS systems to link to TARGET, if they have not done so already, to prepare for the implementation of Stage Three of the Economic and Monetary Union (EMU), scheduled for January 1, 1999.

The existence of RTGS systems is not a guarantee that PVP will be conducted and settlement risk eliminated; it only provides a technical platform to do so.

[44]There are various mechanisms through which PVP can be effected, all of which assure participants that a final transfer in one currency will occur if and only if a final transfer of another currency also occurs. These mechanisms differ with respect to, first, whether recipients are guaranteed payment regardless of whether the related transfers take place or whether payments are refunded when the related transfers are not made, and, second, whether settlements take place simultaneously or sequentially. These different mechanisms have different implications for the liquidity needs and operational setup of the "PVP system." For a more detailed discussion of these alternative mechanisms see pages 22 through 24 of the Bank for International Settlements (1996b).

[45]An RTGS system is a gross settlement system in which processing and settlement take place in real time (continuously).

[46]TARGET is the acronym for Trans-European Automated Real-Time Gross Settlement Express Transfer system.

Settlement risk cannot be eliminated if, for example, a dollar payment is made at the close of business in New York and a yen payment is made at the close of business in Tokyo, as is current practice. First, both parties to a foreign exchange transaction must choose to use a system whereby simultaneous finality can be assured. At the moment, banks are free to choose the payment system through which to make payments. For example, despite the fact that the U.S. Federal Reserve System operates an RTGS system, Fedwire, the bulk of dollar-denominated foreign exchange transactions go through the CHIPS for a number of reasons, not the least of which is that it is cheaper. Second, the PVP assurance would have to come from private sector procedures that would make use of the real-time settlement service. That is, some means of verification would be required to make sure payments have been received before others are released; this is not currently within the purview of the central banks that run, or plan to run, RTGS systems.[47] The reason PVP eliminates Herstatt risk is that PVP obviates the settlement exposure taken on by the participants due the nonsynchronous guaranteed receipt of funds.[48] Even without a PVP system, however, Herstatt risk could be eliminated if the timing of payments in the two currencies of a transaction were perfectly aligned so that payments acquire finality simultaneously. Under current arrangements, this can only happen if both countries have RTGS systems running at the same time. Hence, what is necessary to eliminate Herstatt risk is that both legs of a foreign exchange transaction are guaranteed payment receipt finality at the same time.

A first step to facilitate PVP would be to lengthen the hours of operation of RTGS systems in the countries where they are operational. A major extension of hours in countries trading key currencies could open the way for various PVP systems to develop. Already there is some progress in this direction. In 1993, the Bank of Japan lengthened the hours of BOJ-NET by two hours to 5:00 p.m. local time. While the Bank of Japan's extension did not aid cross-border settlements with the United States (since the extension did not produce overlapping periods between the two RTGS settlement systems), it did facilitate same-day settlement within Japan's payment system. Recently, the Federal Reserve agreed to extend Fedwire's hours of operation to a full 18 hours a day beginning in 1997, opening at 12:30 a.m. New York time. With the extended hours, Fedwire will be open during the entire European business day and will overlap with the final two and one half hours of trading in Japan during standard time and three and one half hours during daylight savings time.

A second possible method for eliminating settlement risk would be to establish cross-border links within the RTGS systems run by the central banks so that verification assuring that, say, a yen payment had been received in Tokyo before the corresponding dollar payment would be released in New York, could be achieved automatically. No private sector third party verifying or aligning payment instructions to the respective RTGS systems would then be necessary. One potential side effect of linking national RTGS systems is that a disruption at one site, resulting from operational or liquidity problems, would affect other sites. This would be an especially difficult situation if the ability to access off-hour money markets was inhibited or the money markets were not deep enough to provide adequate liquidity for the duration of the disruption. Multiple central banks running such linked RTGS systems may be required to supply central bank credit and liquidity facilities until the site of the dislocation was able to adapt.

Another potential problem with linked RTGS systems is the impaired ability of an individual central bank to deal effectively with a local financial problem. Suppose, for example, that the local stock market fell and large securities firms were required to make margin payments using cash. Without enough available cash, securities firms would sell some of their stock of government securities and expect payment in central bank funds. If there were insufficient funds in the domestic system and payment failures occurred, this could delay payments to other domestic or foreign institutions and create a sort of payments "gridlock" (Box 11). While this situation could currently arise, with linked RTGS systems the present set of informal interdependencies would be institutionalized, perhaps requiring more information to be transferred among central banks about the involved institutions. Further, issues may arise regarding which central banks would be responsible for increasing liquidity and how the influx of liquidity was to be "mopped up" after the event.[49] Coordinated decisions about the supervisory norms and rules for members or participating institutions to the RTGS

[47]Most central banks with RTGS systems currently take on some amount of credit exposure. In the United States, the RTGS system, Fedwire, imposes a credit limit (net debit cap) and an explicit price for the use of such credit; that is, a fee is charged for daylight overdrafts. Other central banks rely on collateral to offset credit exposures they take on and still others do not take on credit exposures but rely instead on queuing mechanisms to assure that adequate funds are in senders' accounts before transfers are made to recipient accounts.

[48]While some PVP mechanisms eliminate credit exposures within the settlement process, these mechanisms do not address liquidity risks. For example, if no payments are made out of the system until all other related payments are received, some counterparties receiving funds must wait to use these funds even though they have already paid corresponding funds into the system. This lowers the total available funds (liquidity) relative to an alternative system in which payments are made out of the system without the related payments having been received by the system. In this case, the credit exposure is borne by the system operator or intermediary.

[49]The inflow of liquidity, if not removed in a concerted fashion, may contribute to inflation.

Box 11. Payments Gridlock

A payments gridlock occurs when a disruption to a payments system prevents the timely settlement of some or all of the participants in the payments system. There are a number of ways in which such a gridlock can occur, although it is most frequently envisioned as stemming from a technical or operational problem. For example, a natural disaster in the location where payment system operations are housed could cause a system failure and payments gridlock. Generally, the situation is one in which the failure of one participant to make a payment into the system prevents complete payments to the other participants. When the other participants do not receive the funds owed to them, they might, in turn, be unable to make other payments. The failure of these participants to pay may imply that other participants are also unable to complete timely payments to others. A domino effect is created, potentially encompassing multiple participants in multiple payment systems.

The collapse of Barings Plc at the end of February 1995 illustrates how easily a failure of one institution can cause problems for others, potentially frustrating settlement within a payments system. On Friday, February 24, a clearing bank for ECU transactions sent an ECU payment to one of Barings correspondent banks for settlement on Monday, February 27. After it was established that Barings had collapsed and an administrator had been assigned, the sending bank attempted to reverse the transaction, realizing it was unlikely to be paid the other leg of the transaction on time, but found that the rules of the ECU clearing system did not permit the payment to be canceled. According to the rules, the receiving correspondent bank was also unable to reverse the transaction. At the end of the day on Monday, the sending bank was in a net debit position in the clearing system. The bank agreed to borrow from another bank in the system that had a net credit position in order to cover the shortfall, allowing the settlement of all 45 ECU clearing banks to proceed. However, the sending bank could have decided not to borrow and ECU clearing would not have taken place, causing potential disruptions to other banks and customers in the ECU market, and perhaps, in other markets as well. It could have been the case that there was not enough liquidity in the system to permit the sending bank to borrow the requisite amount—again with a potential chain reaction.

systems would be required as well, since multiple central banks would be acting as liquidity providers or lenders of last resort.

An alternative to linking public RTGS systems is to form a global real-time PVP system run by private consortium, supranational organization, or group of central banks. Although in an early stage of development, one such global clearing bank has been put on the drawing board by the Group of Twenty, a group of 17 internationally active banks.[50] In the private clearing bank, linked foreign exchange payment orders would be matched and immediately settled one at a time through the posting of debits and credits to member accounts at the clearing house bank, using the "continuous linked settlement" approach.[51] The currencies eligible for the clearing house bank would be those in which RTGS systems are available in the home country and in which there are overlapping hours of operation for the national RTGS systems.

Although a private global clearing bank appears to be the most direct method for managing Herstatt risk, there are remaining challenges. First, the clearing bank's ability to guarantee finality of payment in each country is uncertain. Finality would require a coordination of the legal status of settlements in each country and involve the location and corporate form of the clearing bank and its relation to the national settlement facilities (Box 12).

Second, the operation of a global clearing bank might have an impact on liquidity in short-term money markets and, thus, on central bank liquidity management, and, perhaps, on monetary policy objectives. If a global clearing bank required its members to pay large sums of money into their accounts to cover large volumes of settlements, it might drain liquidity from the domestic money markets. The drain of liquidity might offset the ability of a central bank to control short-term interest rates and their provision of intraday liquidity to domestic money markets, potentially increasing the volatility of demand for central bank credit. The timing, as well as the amounts, of funds involved in global clearing bank settlement procedures might also present a problem for short-term money market liquidity. Clearing bank procedures may require funds to be available to support settlement during the periods of overlapping hours between the various national RTGS systems. For instance, when Fedwire extends its operating hours in 1997, the expected overlap of the RTGS systems in the United States and Japan will be between 12:30 a.m. and 3:00 a.m., New York time. It is unclear whether sufficient liquidity would develop in the U.S. market during these off-hours to support PVP settlement of dollar-yen transactions.[52] Finally, a single sys-

[50]However, the outline of the global clearing bank presented here is based on information gained prior to May 1996. No formal documentation has yet been released.

[51]This approach was first presented in New York Clearing House Association (1995).

[52]Alternatively, a global clearing bank could be structured to use funds provided by a central bank to facilitate sequential settlements in which payments out of the clearing bank would be made prior to related payments into the clearing bank. A central bank may charge for the use of such central bank funds and, further, the use of funds within a global clearing bank may limit the remaining balances available for domestic payments. In fact, this would be a case in which a global clearing bank simply takes over the role each central bank currently plays in supplying credit for the functioning of its own RTGS system.

Box 12. Settlement Finality

Settlement is final when a settlement system's rules deem that the payment is irrevocable and unconditional. The ability to use the funds for other purposes is not a guarantee of finality since there may be situations in which it may be permissible to request that the payment be returned after it has been disbursed. Thus, in some cases, even after payments have been made, they may subsequently be able to be revoked. When central banks operate a payments system and provide accounts through which payments are made, the central bank determines when (and if) settlement finality occurs. Funds that are received and deemed "final" through a central bank settlement system are sometimes referred to as "good funds." Not all payments through a central bank have finality. For example, the non-Fedwire transactions through the Federal Reserve Banks in the United States do not guarantee immediate finality for checks as would be guaranteed through Fedwire.

It is generally accepted that only central banks can provide settlement finality since their role of lender-of-last-resort permits them to supply unlimited funds (that is, print money) to compensate for any failures to deliver funds into the payments system by participants. However, other private payments systems often refer to their ability to assure settlement finality. In this case, settlement finality refers to the assurance provided by the private payment system that, in the event of one or multiple participant failures, settlement among the remaining participants will occur. The assurance of final settlement is based on the definitions for the irrevocability of payments and the procedures and protections built into the private payment system.

tem purporting to settle the majority of global foreign exchange payments would make it vulnerable to technological failures; several redundant systems would probably be required to safely minimize this risk. While the problems with this option are not insurmountable, harmonizing national laws and procedures for liquidity provision is a difficult and time-consuming process.

Netting Arrangements

In theory, the establishment of a well-constructed global clearing bank could eliminate foreign currency settlement risk. However, because the development of such a system is still in its nascent stages, other approaches such as the development of multilateral and bilateral netting are receiving increased attention. Formal bilateral netting systems have been available since 1990 and informal bilateral arrangements can be privately negotiated between counterparties at any time. Two multilateral netting systems have been under development for some time and the first became available in August 1995. The notion underlying these approaches is that if settlement risk cannot yet be eliminated, at least it can be reduced and better managed. Netting systems (both bilateral and multilateral) can dramatically lower the size and number of payments transferred among counterparties, thereby eliminating a large proportion of the settlement risk. Netting systems are not stand-alone methods for eliminating settlement risk, however. After payments are netted, banks must still utilize a payment system that guarantees finality of payments.

Bilateral netting systems periodically aggregate the amounts owed between counterparties and calculate one payment per currency for each pair of counterparties. Bilateral netting can reduce amounts at risk by an estimated 50 percent on average. Multilateral netting systems net the amounts owed among a group of counterparties through a clearing house arrangement resulting in one payment each day in a given currency to or from the clearing house by each counterparty. The reduction in settlement risk obtained through multilateral netting ranges from 73 percent, for a group of about 20 participants, to as much as 95 percent if there are more participants in the netting scheme.

There are currently four main netting systems operating for foreign exchange—two bilateral and two multilateral (Box 13). The bilateral systems allow pairs of banks to match and confirm their trades with one another and net their foreign exchange deals. The systems only calculate the net amounts the pairs of banks owe one another—there are no automatic payment facilities and neither of them assume foreign exchange exposures. The two multilateral netting systems are set up differently from each other, although there are some common elements.[53] Both multilateral systems provide a clearing organization that operates as the counterparty to the trades within the system. They both require collateral and/or margin from their members under certain circumstances and both have established means of dealing with a defaulting member. Since a default by a member causes a potential immediate liquidity problem and losses to at least some of the other members, both multilateral netting systems have procedures for assuring the continuance of payments to other members.

One of the primary difficulties facing multilateral netting systems is to attain legal enforceability of the netted contracts. Compared with the creation of other types of clearing houses (for example, futures exchange clearing houses), a foreign exchange netting

[53]Although one of the systems, MULTINET, is not yet running, its system design is unlikely to change significantly prior to its expected introduction in late 1996.

Box 13. Bilateral and Multilateral Netting Systems

There are two widely used *bilateral netting systems*. In the SWIFT Accord system, the messaging service that SWIFT (Society for Worldwide Interbank Financial Telecommunication) provides its customers is combined with an optional bilateral netting service. In May 1996, 27 financial institutions used the netting service processing about 1,000 orders a day. FXNET, another bilateral netting service, provides pairs of banks with the ability to match, confirm, and net their transactions without the information going through a third party. In May 1996, the system was used by 70 banks. FXNET estimates that its $173 billion daily turnover is reduced to $80 billion by bilateral netting. The type of bilateral netting executed by FXNET is netting by novation. Novation implies that a new contract, representing the net position, replaces the old one as successive transactions are undertaken. It applies to payments in the same currency on the same settlement date.[1] It is thought that this type of legal construct for netting is appealing to banks in the United States and Switzerland.

The two *multilateral netting systems*, the Exchange Clearing House (ECHO) and MULTINET, provide a set of members with the ability to net their payments within the group thereby lowering the amounts owed.[2] Members make a single payment for each currency to the central system, termed a clearing house. The clearing house reduces the settlement risk of the participants by lowering the number and amounts of the payments. However, it does not eliminate it, since all netted transactions still require settlement over a national payment system.

ECHO is based in London and supports 24-hour, global netting. As of May 1996, 13 banks use ECHO and another 7 banks are preparing to join the system. ECHO's netting structure operates under English law and uses the contractual process of "open offer," in which ECHO becomes the counterparty to a deal as soon as the eligible foreign exchange contracts are arranged by members. The contract is accepted by the clearing house without the need for immediate communication or prescreening. ECHO does not use the legal process of novation.

Although ECHO is a party to all transactions, the risk of loss resides with the participants who chose to deal with the clearing house. The participants who deal with a defaulting member within ECHO bear a pro rata share of any resulting loss: those that chose not to deal with that member suffer no loss. The advantage of this system, according to ECHO, is that the incentive to monitor credit risk of counterparties is preserved. However, to make sure the total possible loss to the clearing house, and its members, is kept within reasonable bounds, the clearing house has a series of limits that will restrict the amount of exposure a counterparty can present to the system without also providing margin for the excess.[3] The margin is called after a limit has been breached but must be supplied before settlement to assure time to withhold outgoing payments to the user if margin has not been posted.

To maintain sufficient reserves in the unlikely event of a default, ECHO holds collateral provided by the members and has a number of sources of liquidity. To conform to the Lamafalussy requirement that ECHO must be able to withstand the failure of its largest user, it holds collateral in excess of $1.1 billion.[4] An additional 2.5 percent of a user's exposure limit with ECHO is also held in reserve. ECHO has access to over $6 billion through committed swap and stand-by loan facilities with its nostro agents, the banks acting as correspondent banks in each country.

In MULTINET, the other proposed multilateral netting system, a slightly different scheme is employed. MULTINET would become the counterparty to a matched deal after determining that the deal is within the clearing house's risk limits. A participant's trade would be subjected to as many as five separate criteria before it is accepted. If rejected, the deal is to be settled using bilateral netting techniques. However, once the deal is accepted, a "novation and substitution" process would be used to establish a new contract between the respective counterparties and MULTINET. This process implies that any legal actions regarding the contracts would involve Multinet as the counterparty to such contracts.

The loss-sharing agreement for members of MULTINET is designed to be similar to ECHO's. Like ECHO, it would divide up a failed payment among the members who dealt with the defaulting party and who would have had exposure on a bilateral basis. MULTINET would collect collateral from its members to be used for defaults. The general collateral pool for settlement and liquidity risks for spot transactions will consist of $350 million at the start of the clearing house. Members submitting forward deals to MULTINET are expected to fully collateralize any forward replacement exposure as well as provide collateral to cover five days worth of market risk. If there is a failure to pay by one of the members, that member's collateral would be used to satisfy the forward replacement exposure obligations.

MULTINET will attempt to implement PVP by not releasing funds to a member until that member has made the requisite payments into the clearing house. The payments will not be quite simultaneous since the clearing house sets its payment deadline one hour prior to the time it expects to release funds. To help efficiently process settlements, MULTINET intends to apply for direct access to Fedwire through its own account at the Federal Reserve rather than having to use an account at a correspondent bank in the United States.

[1] In the United States, novation of contracts can also occur across settlement dates.

[2] Since 1992, MULTINET has run a bilateral netting facility, which now consists of ten banks. MULTINET has not begun actual settlements through its multilateral clearing system, but is expected to begin operations in late 1996.

[3] Basically, the limits are based on the counterparty's credit quality and its size, as measured by tier 1 capital.

[4] The $1.1 billion figure is equal to the largest user's exposure limit to ECHO.

system cannot operate effectively without resolving the legal status of contracts in many different jurisdictions. First, the clearing house itself needs to be able to guarantee the contracts it enters into are legally binding. Also, the institutions from different legal jurisdictions need to guarantee their ability to net and enter contracts with the clearing house. In addition, the counterparties and clearing house need to assure themselves of access to collateral that may be held in yet a different legal jurisdiction.

The legal uncertainty surrounding foreign exchange netting originates in differences in countries' insolvency laws. The basic question is whether netting is valid when one of the counterparties goes bankrupt. When such a situation arises between counterparties in two jurisdictions, attempts to net will depend on the insolvency laws of the defaulting party.[54] Another issue is which counterparty has control of the collateral and when. Multilateral netting systems have obtained legal opinions from all of the members' jurisdictions, in addition to their own jurisdictions, hoping to gain legal certainty for their operations. However, since insolvencies involving multilateral, multicurrency foreign exchange netting systems have not yet occurred, there is no legal precedent on which to base a legal opinion. Thus far, then, the opinions represent only an informed interpretation of the relevant law.

Another design issue for a multilateral netting system is the risk management system and its collateral or margin requirements. To attract members and to satisfy regulators that the multilateral netting will lower settlement risks, netting systems need to assure that the clearing house does not take on settlement exposures that cannot be covered in the unlikely event of a failed payment or a bankruptcy of a user. While there are a number of methods to manage settlement exposures, the basic risk management tools of the multilateral netting system utilize a combination of real time exposure limits, the collection of collateral or margin, and a precise set of operating procedures to limit the amount of time that settlement risks are present. Different combinations of these tools have different implications both for the costs to members and for benefits provided to the financial system as a whole.

There are numerous variations on the use of collateral. For example, members may be required to contribute, ex ante, to a collateral pool a proportion of their spot market volume and the entire balance of forward exposure in the system. Alternatively, margin may be requested, ex post, if a spot or forward exposure exceeds certain limits. The first option is costly for members, but provides a larger cushion in case of a failure. The second option is cheaper for members, but may provide less protection. The Lamfalussy minimum standards (standard IV) require that the "multilateral netting systems should, at a minimum, be capable of ensuring timely completion of daily settlements in the event of an inability to settle by the participant with the largest single net-debit position."[55] While it may first appear that the more collateral the better, the use of collateral is not a panacea. The value and liquidity of collateral changes with market conditions. Valuation of collateral holdings may be especially problematic in turbulent market conditions, times in which a failure is already more likely. In fact, the problem may worsen because the value of the collateral might decline exactly when members are having difficulty making payments. Thus, the apportioned collateral may not be enough to cover a loss when it occurs. Typically, careful attention is paid to requiring enough collateral for all but the most unlikely circumstances. However, it is the most unlikely circumstances with large costs that are of systemic concern.

Multilateral netting systems typically use a set of limits that prevent members from taking on "excessively" large exposures with other members and with the multilateral netting facility. These limits, however, are only as good as the risk management system that produced them. In fact, although a detailed risk analysis may be performed on the transactions within the netting system, the system may not have access to members' full portfolios and thus cannot accurately assess the other risks attributable to each member. Additional data, such as the credit rating of a member, may be used as a proxy for other risks a member takes on, helping to more accurately set exposure limits. Although not all of the foreign exchange settlement risk can be controlled by a set of system exposure limits, the limits are the first line of defense to protect the netting system against excessive exposures taken on by one or more of its members.

The operating procedures of the multilateral netting system are critical to determining the extent to which settlement risk is reduced. Since by definition, netting takes place over a period of time, forms of PVP that require simultaneous intraday settlement of both legs of a foreign exchange transaction cannot be feasibly linked to netting systems. However, once the netting has been accomplished at a point in time, the settlement of the remaining net payments can, in principle, be executed using a PVP mechanism. One of the two netting systems attempts an imprecise version of PVP in which the clearing house collects payments from participants before releasing its payments to the recipient participants. In most circumstances, the difference between the time when the multilateral netting system receives payments and makes its own payments is expected to be within a

[54]The counterparties may specify in their agreements that the law of a sympathetic jurisdiction will apply. Whether this type of arrangement will be upheld varies from jurisdiction to jurisdiction.

[55]Bank for International Settlements (1990), Part C, p. 26. The report, called "The Lamfalussy Report," provides minimum standards for the design and operation of cross-border and multicurrency netting and settlement schemes.

few hours. But, unless there is simultaneous finality of received payments, there remains some degree of Herstatt risk. Obviously, the closer in time the two legs of the transaction obtain finality, all else equal, the shorter the duration of Herstatt risk.

Still, whether a PVP mechanism is used or not, a disruption due to the failure of one counterparty affects other members of the system. Furthermore, there is no guarantee that the loss will always be small enough that the affected members will not have payment or liquidity problems of their own. That is, a domino effect could be created if the loss was large enough. To foreclose the possible transference of one failure to other members, multilateral netting systems need to be assured of an ability to acquire funding in cases where payments are withheld due to failures. Multilateral netting systems have broached the funding issue either by holding collateral or by assuring themselves of outside sources of liquidity, for example, lines of credit and foreign exchange swap facilities, mostly with member banks. As with collateral valuation in times of stress, it is unclear whether these lines of credit can be relied upon, since the member banks themselves may be affected by a liquidity problem. Ultimately, then, central banks serve as the backstop in a liquidity crisis, just as they would without multilateral netting systems. In theory, the central bank's ability to monitor the multilateral netting system and the system's capacity to reduce both the settlement amounts and the number of transactions imply that it is unlikely that the lender-of-last-resort role of central banks would be used.

Without considering other multilateral multicurrency clearing bank arrangements, the existence of two multilateral netting systems may not be self-sustaining. The degree of risk reduction is a function of the number of linked counterparties. The greatest degree of risk reduction is obtained when all the largest participants join the same system. It may not be cost-effective for a single bank to become a member unless the other banks with which the bank does most of its foreign exchange business join the same netting system.[56] Furthermore, each bank waits to see what its counterparties do, delaying full-scale realization of the risk reduction possibilities until a sufficient minority join one netting system to make it cost-effective for the others.

With the recent Group of Twenty initiative to develop a global clearing bank, the bilateral and multilateral netting systems face further challenges. While, in principle, the two approaches to lowering Herstatt risk could be viewed as complementary, both require scarce funds from banks' foreign exchange trading businesses.[57] Further, as competing approaches to the reduction of Herstatt risk present themselves, banks may wait until one system emerges a clear "winner" before attempting to reduce their own settlement exposures. Banks perform both an evaluation of current cost as well as an evaluation of future costs, including the cost of employing specialized technology that may require augmentation or alteration if another system is subsequently used. Both netting systems and a global clearing bank become economically viable only when large payment volumes are transferred through the system.[58] Hence, competition among the groups developing methods to lower Herstatt risk may have the effect of reducing the effectiveness of any one system.[59] Moreover, competing systems have the unfortunate effect of slowing the adoption of strategies to reduce Herstatt risk as potential users wait for a private sector "winner."

Other Solutions to Settlement Risk

A natural extension of limits imposed on the members of a multilateral netting facility is the internal exposure limits in the institutions making up the foreign exchange market. Bilateral exposure limits to one's counterparties help make an institution less vulnerable to a failure of one of its counterparties. An institution also lowers settlement risk to others by limiting its own overall exposure in the foreign exchange market. In most countries, voluntary limits are enhanced by rules regarding the degree to which exposures can be concentrated in one or several related institutions. In some countries—Belgium, Denmark, and the United States—there are no explicit limits preventing individual banks from taking on excessive foreign exchange positions, and institutions set their own internal limits.[60] In Australia and Portugal, foreign exchange exposure limits are imposed by the authorities, but are not public and are specific to each bank. In most other industrial countries (Austria, Finland, Germany, Japan, Netherlands, New Zealand, Norway, and Switzerland) there is a formal capital charge against foreign exchange positions implying an implicit exposure limit relative to the institutions's capital.[61]

Recent market risk proposals from the Basle Committee on Banking Supervision, and their adoption over the next year and a half, should also serve to indirectly

[56]FXNET, one of the bilateral netting systems, and MULTINET, a multilateral netting system, are already discussing their potential integration.

[57]Interestingly, some banks are members of both the netting systems and the Group of Twenty.

[58]In netting systems, of course, the large number of payments is reduced within the system as a result of the netting. The proportionate reduction of exposures, however, is intimately tied to the number of participants and the dispersion of their transactions among the other participants.

[59]On the other hand, if there were only one private organization offering services to reduce Herstatt risk, it could potentially engage in monopolistic pricing of its services.

[60]In the United States, however, large exposure monitoring of foreign exchange positions is done weekly, as mentioned below.

[61]See Hartmann (1995).

limit foreign exchange settlement risk to the extent it is correlated with the risk of market fluctuations in exchange rates. In the standardized approach for assessing market risk capital requirements, an 8 percent capital charge is applied to the higher of either the net long currency position or the net short currency position.[62] The Basle Committee's market risk proposal also permits banks to use their internal value-at-risk models as the basis for market risk capital requirements. In this approach, foreign exchange is one of the four major risk categories accounted for in the value-at-risk model.[63] Currency exposures should be accounted for within the model for all currencies in which the bank has a significant exposure. Historic correlations among the currencies and between the currency category and other main risk factors are permitted in order to lower the measured risk within the model. However, the model's result, a value-at-risk number, is multiplied by three, at a minimum, to arrive at the required capital. Both the standardized and the internal models methods thus provide an implicit limit on the amount of foreign exchange market risk, which may also indirectly limit the settlement exposures by potentially limiting the size of positions, that can be taken on by a bank since capital must be held against such positions.

The existing risk management techniques could also be augmented or altered to measure and manage settlement risks. For example, existing credit risk control processes used by banks could be adapted to identify and control the counterparty foreign exchange settlement exposures. Improved back office payment processing, correspondent banking arrangements, and bilateral netting capabilities may also reduce settlement risks. Altering the timing of payments and identifying final or failed receipts as soon as possible could also help banks shorten the duration of settlement risks. These solutions require no public sector involvement and are estimated to provide a substantial reduction in foreign exchange settlement exposure.

Large Exposure Monitoring

Private sector banks protect themselves from a defaulting counterparty by imposing internal exposure limits. However the aggregate exposures taken on by multiple institutions can still pose problems, especially when a similar group of institutions take similar positions. In this case, individual limits may not be sufficient and public sector surveillance may be warranted. This is mainly accomplished through large exposure monitoring.

Large exposure monitoring by supervisory and regulatory authorities exists in several Group of Ten countries. In the United States, for example, each foreign exchange market participant that had more than $50 billion worth of foreign exchange contracts at the end of any quarter within the past year is required to report.[64] The reports are submitted once a week and cover positions in the Canadian dollar, deutsche mark, pound sterling, Swiss franc, and Japanese yen. The data are reviewed by the Federal Reserve banks and authorities at the U.S. Treasury Department for excessively large positions, but are not published or otherwise publicly disclosed. In principle, large position holders could be asked to reduce their positions. However, any action taken as a result of monitoring the large positions is not known.

In some countries, such as in France and Italy, monitoring is accomplished by having banks that execute transactions above a threshold report these transactions to the authorities. These types of reporting arrangements are rooted in recent attempts to limit money laundering in the home currency, not to specifically examine large exposures of foreign exchange market participants in multiple currencies. In fact, the thresholds for reporting typically refer to home currency-denominated transactions and not to transactions denominated in other currencies. Furthermore, in some cases, the reporting is aimed at transactions performed by "customers," not transactions with other interbank participants.

The purpose of large exposure monitoring is to make sure that no one or group of participants is taking a position that could precipitate a systemic problem. Given the global nature of the market, to adequately monitor participants' overall positions, authorities would need to collect data from the large participants in the foreign exchange trading centers, consolidate the data, and communicate their findings to one another. Authorities in some countries have Memoranda of Understanding (MOUs), enabling them to share such information with their counterparts in other countries. However, these MOUs are mainly established for the exchange of information after a crisis has emerged and enforcement proceedings are under way. Currently, no countries routinely share large exposure reports of OTC foreign exchange dealings.

[62]These positions are the sums of long and short positions, respectively, in various currencies valued in the reporting currency at the current spot rate.

[63]The others are interest rates, equities, and commodities.

[64]A market participant is broadly defined and includes not only banks, foreign banks, and broker dealers, but nonprofit institutions, sole proprietorships, mutual funds, and hedge funds as well. The report is filed on a fully consolidated basis, but data need not be collected from offices or subsidiaries that have "relatively" small position limits in terms of the reporter's overall activity.